



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

THE AMERICAN NATURALIST.

VOL. XX.—*JULY*, 1886.—No. 7.

A NEW TRAP-DOOR SPIDER.

BY PROF. GEO. F. ATKINSON.

IN his excellent work on trap-door spiders Mr. Moggridge says: "There would doubtless be a just feeling of pride and satisfaction in the heart of a naturalist, who could say that he had made himself thoroughly acquainted with all the species of a particular group of animals, had learned their most secret habits, and mastered their several relations to the objects, animate and inanimate, which surrounded them. But perhaps a still keener pleasure is enjoyed by one who carries about with him some problem of the kind but partially solved; and who, holding in his hand the clue which shall guide him onwards, sees in each new place that he visits fresh opportunities of discovery. The latter is certainly the condition of those who take an interest in searching out the habits and character of the trap-door spider."¹

While many interesting facts in the life-history and architecture of trap-door spiders were observed and collated by Mr. Moggridge, he very modestly says that many remain yet to be gathered in; that we are only on the threshold of discoveries of these creatures, who have lain quietly in the earth century after century, and that he will be satisfied to have been able to "hold the door sufficiently ajar to permit those who love nature and her ways to catch a glimpse of the wonders and beauties of the untrodden land that lies beyond."²

A favorable circumstance afforded me an opportunity for making some observations on the unseen "wonders and beauties

¹ Harvesting Ants and Trap-door Spiders, Supplement, p. 180.

² Harvesting Ants and Trap-door Spiders, p. 136.

of the untrodden land" which is the abode of these interesting creatures, and it is with a sense of pleasure that I note them.

Some time in the latter part of May or early part of June, 1885, Mr. Merritt, of Pittsborough, N. C., brought to Chapel Hill two trap-door spiders with their nests, and placed them in the care of Professor Holmes for the University of North Carolina. The nests with their occupants were placed in the ground for the summer. On Nov. 12, after a careful search, Professor Holmes was able to find only one, and this one with difficulty, as for some reason it had dug through the lower end of the tube and was hidden in the earth. Later I shall offer what seems to me may be an explanation of this. On the morning of the same day the spider with its trap-door nest was placed in my keeping, which was the first intimation I had of the presence of such an agreeable neighbor.

At 4.30 P.M. I placed three and a-half inches of earth in a glass jar five inches in diameter and seven inches deep. Two-thirds of the surface of the soil was then covered with moss. In this the spider was placed, and the jar and its contents taken to my room, that I might, if possible, observe the operation of digging the tube and making the trap-door.

The results were most gratifying. Just before going to supper, at dusk, I observed that the spider had not undertaken the work. Upon returning, at 8.30 P.M., I found the task undertaken. The spider was resting in a hole about 20^{mm} deep by 22^{mm} in diameter, which she had excavated at one side of the jar. I placed the jar upon my study table, just beneath the light of a student lamp, so that while reading I could observe any movements made by my companion. The spider was resting in the hole with its legs partially folded, the anterior ones lying upon the edge of the excavation.

After I had been quiet for some time the spider began to move cautiously, and turning about slowly went head first into the hole, and dug from the bottom with her mandibles a pellet of earth about the size of a small pea. Then turning carefully around she placed it at the edge of the hole, where she pushed it off with the aid of her palpi, at the same time working her mandibles up and down. At first the spider seemed timid, and would cease operations upon the slightest movement on the part of myself. During the course of the evening three other

persons, who came to my room, had the fortune to witness the operation of digging out the earth. The spider soon became bold, paid no attention to movements in the room, and permitted me to watch her very closely. Occasionally, by using both palpi at once, the dirt was flirited suddenly from the grasp of the mandibles with such force as to strike against the opposite side of the jar. Had it not been for this obstruction the dirt must have been thrown three or four feet.

After depositing each load on the edge of the hole, the spider would turn around again for another load, but before picking it up she would project the posterior pair of spinnerets about 5^{mm} from the abdomen and carefully knead the viscid liquid upon and around the freshly placed pellet of earth and over the edge for a distance of 4 or 5^{mm} for the purpose of making the soil adhere and prevent its caving in. In Plate xxiii, Fig. 4, the spider is shown in the act of removing a pellet of earth from her mandibles. In Fig. 5 is represented the application of the viscid liquid. The ends of the spinnerets are applied to the surface alternately, as shown in the illustration. The legs took no part in the application of the viscid liquid; nor did the liquid form a thread when the spinnerets were drawn from the surface, as I have since seen it when the spider was crawling about on the surface of the earth.¹

At 11.30 o'clock, when the hole was about 4^{cm} in depth, to my surprise and pleasure the spider began to make the "trap door." Standing upon its fore feet and placing the spinnerets against the glass jar at the level of the edge of the hole, the spider covered the glass with the viscid liquid. Several pellets of earth were stuck to this, each time another portion of the viscid liquid being applied. After a depth of 5^{mm} had been built up in this way, which was to answer as the hinge, the spider cut a sprig of the moss and cemented it to the hinge so that the end projected above it. Small sticks, particles of moss and earth were constantly placed upon the edge of the growing door. Each time the spider would come out of the hole for new material, retreat backward, and turn half way around so as to apply it to the door. Placing the load

¹ As I am now writing, Jan. 16, 1886, 11.55 P.M., the spider is crawling about on the surface of a freshly prepared jar of earth. Sometimes the viscid liquid adhering to some object is drawn out in a band of silk 2^{mm} wide, and the pieces of moss strewn on the earth are loosely matted together in the path of the spider about the side of the jar.

on the under side of the partial door, she would carefully move it up to the edge. Then placing the distal portion of the palpi and anterior pair of legs above, while the proximal portion of these limbs and the ends of the mandibles were on the under side of the pellet and door, she would fit and press it in shape, as one would mold with the hand a moist portion of earth by pressing it into a thin sheet. This is illustrated in Fig. 7, Plate XXIII. Indeed it looked very much like the black bony fingers of a hand performing the work of pressing. The greatest pressure seemed to be brought to bear upon the rounded ends of the mandibles. After fastening on a portion thus, the spider would take an inverted position and apply viscid liquid along the edge and under the surface of the door, as shown in Plate XXIII, Fig. 6. She would then turn about and crawl out for more material. The hole being by the side of the jar, I could watch the operation both in the hole and upon the cover. By one o'clock in the morning (Nov. 13) the door was finished so that the spider could pull down the lid, which completely closed the entrance, nicely fitting in around the edge and appearing as if there was no hole nor spider, but through the glass the spider could still be seen.

At intervals during the construction of the door the spider would pull it down to observe where the next pellet should be placed in order to make the door fit the circular opening of the tube. Discovering this she would turn completely around, and not being able, with her head in the bottom of the tube, to see the place where she intended to put the next load, she would find it by feeling about with her spinnerets. The viscid liquid would then be applied and the pellet of earth fitted with extreme nicety.

Satisfied with the result of my experiment I retired. By day-break I found that the excavation was continued after the completion of the trap door, the soil being deposited around the nest to raise the surface of the earth in the jar to a level with the top of the nest. Without close searching it was impossible to detect the door.

The mode of making the trap door by this spider differs very widely from that observed by other naturalists so far as I can find any record. Mr. Moggridge saw the female, *Nemesia meridionalis*, construct a trap door in captivity. He made a cylindrical hole in a flower-pot of earth. Into this the spider disappeared. "During the night following the day of her capture she made a

thin web over the aperture, into which she wove any materials which came to hand. The trap door at this stage resembled a rudely constructed, horizontal, geometrical web, attached by two or three threads to the earth at the mouth of the hole, while in this web were caught the bits of earth, roots, moss, leaves, etc., which the spider had thrown into it from above. After the second night the door appeared nearly of the normal texture and thickness, but in no case would it open completely, and it seemed the spider was too much disgusted with her quarters to think it worth while to make a perfect door."¹

He also records the making of a door by a very young one of this species, in which the threads, except at the hinge, were cut so that the door would open and shut.²

The only thing he records which seemed at all analogous to the mode of making a trap door exhibited by the spider in my possession is that manifested in the enlargement of nests and trap doors by spiders as they grow larger, and consequently require nests of larger dimensions. This operation was not witnessed by him, however, but the additions to the size of the door were proven by measurements and observations upon nests of young spiders at different seasons.³

It would seem natural to suppose that in making slight additions from time to time to the edge of the nest, the spider would cement pellets of earth, pieces of moss, etc., to the edge instead of first spinning a web; unless the web is spun over the lower side of the door and made to project just far enough to fit the enlarged tube. In Plate XXIII, Fig. 8, can be seen eight concentric "lines of growth," as they might be termed, of the trap door, corresponding to the growth and needs of the spider. These I judge to represent the successive enlargements of the door concomitant with the enlarging of the tube. We can safely say that these additions were made by cementing the material, piece by piece, which forms each ring, to the edge of the door. These "lines of growth" are not present in the door made by the adult spider in captivity. I induced the spider to make the door the fourth time (Jan. 19, 1886) in order to observe if there was any regularity in the cementing of the particles, which might form

¹ *Harvesting Ants and Trap-door Spiders*, p. 118.

² *Idem*, p. 119.

³ *Idem*, pp. 123, 127 and 150, and Supplement, p. 245.

these lines of growth in a door made by an adult spider. There is no such regularity. Indeed, this last door was made of about a dozen very large pellets of clay which, being very plastic, the spider was able to press each pellet into a sheet of considerable dimensions.

It is to be regretted that Mr. Moggridge did not have the opportunity of observing the manner of enlargement of trap doors made by the spiders which he studied, or that he did not offer some theory as an explanation. If the particles are cemented to the edge, it would be quite natural that the species of spider in my possession once made its door by first spinning a web across the mouth of the tube, and then weaving into it other material, as in the case of *N. meridionalis*, and that the habit, followed through life and successive generations, of making additions to the door by cementing particles to the edge, finally became so fixed that this mode of making additions to it became the permanent habit and type of construction of the trap door from the foundation! The rapidity, ease and intelligence manifested in this method of building up the door, piece by piece, certainly indicates a higher development of instinctive power. A perfect and neatly fitting and swinging door made in $1\frac{1}{2}$ hours!

When I took the spider from her nest it was necessary to remove nearly all of the soil from the jar and take her from the lower end of the tube, as all efforts to attract her from the nest failed. As the soil was very loose and the nest not long made, the walls of the tube collapsed. In ten days the spider was returned to the nest. Though the trap door was capable of being used, and seemed to satisfy the spider's idea of the "fitness of things," it was in a very dilapidated condition. This agrees with what Mr. Moggridge says of the reluctance manifested by spiders to abandon an old nest. The examples cited by him are, that if a door be pinned back during the night, a second door will be made; that if the nest be covered with earth, the tube will be prolonged to the surface of the superimposed earth and a new trap door will be made; and that in some cases nests become inverted, when a door being made at the now upper end of the tube, the nest will have a door at each end.¹ The conduct of my spider under another condition farther illustrates this feature. Wishing to observe the habit of the spider, if possible, while the

¹ Harvesting Ants and Trap-door Spiders, pp. 121 and 122.

door of the nest was closed, I prepared a glass test tube, 17^{mm} in diameter, by placing 4^{cm} from the mouth a cork bottom, so that the spider might have something on which to stand while making the door. This, with the spider in it, I placed in the glass jar and surrounded it with earth to darken the walls, hoping thus, because of the firm smooth surface of the tube, she would not line it with silk, and by lifting the tube from the soil I could observe the position of the spider as it held down its door. The experiment was a decided success.

This was prepared at eleven o'clock on the night of Dec. 27 '85. Pieces of moss were strewn about the tube. By morning a perfectly fitting door, beautifully covered with moss, had been constructed (Plate xxiv, Fig. 3). About this time many visitors came to see the spider, and in pulling at the door to show how persistently she would resist its being opened, the hinge became loosened and the door was pulled down upon her. She held on to the door with such tenacity that I pulled it into bits in my efforts to remove it from her grasp. It was removed Dec. 30, '85, and on the following night she built another as neatly as the first. The hinge to this became loosened and the door moved down about 5^{mm} from the mouth of the tube. Here she strengthened the hinge by spinning a broad piece of silk, the width of the hinge, from the door down on to the wall of the tube. Several times in endeavoring to open the door I tore pieces from its edge, and in every instance the spider repaired it. Finally, when I wished to remove her from the tube I was obliged to push up on the cork bottom, and in this way crowd her out through the door. After this was done it was with some difficulty that she freed her posterior feet from the silk bag which she had constructed at the bottom, so firmly did she hold on.

I have this yet to add. In a note I have mentioned the wandering of the spider about in a jar of freshly prepared earth, Jan. 16. For three days she has been restless, and though several attempts have been made to dig a tube she had failed. I came to the conclusion that the soil was not such as she could work easily or satisfactorily. Wishing to have soil which would make a more durable tube than the loose soil in which I saw the first nest made, I used a large proportion of fine plastering sand mixed with black earth. This was wetted, and pieces of moss strewn over the surface. She tried several times to take up pellets of the

earth, but seemed to be disgusted with its crumbling. She then tried to bore a hole by pushing down with her mandibles while turning her body around. She evidently wished to hide her head from the light, for after making a hole 2^{cm} deep she remained with her head at the bottom. To-day, Jan. 14, '86, the soil in the woods having thawed sufficiently, I prepared a jar of moist ferruginous clay, very much like that of which the nest is constructed that came from Pittsborough. Upon this I put a fine mat of fresh moss, covering the earth except a spot at one side 2½^{cm} in diameter. In this I placed the spider at noon. I then covered it from the light. As I returned to my room after dinner, she was resting in a hole 3^{cm} deep which she had excavated, and small pellets of earth were placed against the moss at the mouth of the hole. She would not work during the day unless I covered the jar from the light. During the evening, by lamp light, I had the pleasure of seeing her make another door. It required about one and a half hours. Only one piece of moss was used, and that I let drop into the hole while she was at work. This seemed very strange, for the tube was the only place not covered with moss, and to save her the trouble of cutting the moss I had strewn loosened particles about the hole. In this case all of the earth used in the construction of the door was taken from the bottom of the hole. The door being made almost entirely with the clay was very conspicuous in comparison with the surrounding moss; though the door fitted very neatly, the tube being built up to a level with the top of the moss. This time instead of making the hinge against the side of the jar it was made on the opposite side of the tube. Surely this persistence is equal to that shown by the spider who, making her web the thirteenth time, taught a general lesson of perseverance.

I was unable to understand how the resistance to opening the door was offered, if the spider fastened its fangs and *all* of its claws into the under surface of the door, as Mr. Moggridge states.¹ A reference to Plate xxiv, Figs. 3 and 4, will show the results I reached in the experiment when the spider was induced to make a trap door to the mouth of a glass test tube. The portion of the tube from *b* to *c* was not lined with silk. The spider, evidently not admiring the cork at *d* for a bottom to her nest, carried in pellets of earth and bits of moss as shown at *g*. She

¹ Harvesting Ants and Trap-door Spiders, pp. 95-96.

then spun a short bag of silk, *f*, which was attached by the mouth to the walls of the tube at *c*, and rested on the piece of cork. The mouth of the test tube was lined with silk from the edge for about 5^{mm} to 7^{mm}. The ends of the silk lining at *b* and the silk bag at *c* were for some distance transparent, so that I was enabled to see the spider fairly well. As can be seen in Fig. 4, the spider clings to the bag of silk at the bottom (or walls of the tube) with the claws of her two posterior pair of legs, and to the under surface of the door with her fangs and the claws of her anterior pair of legs. By partially lifting the door I was enabled to see the hold upon the door, and when I pushed the spider out of the tube, as before stated, I found her feet entangled in the bag of silk. The manner in which this spider holds down the door is precisely the same as that described by Emerton¹ in the case of *Cteniza californica*, except that he states the "third and fourth pairs of legs are pressed out against the walls of the tube."

The nest of this spider belongs to the simple, unbranched type with shallow cork door. The door belonging to the nest in which the spider was caught (Plate xxiv, Fig. 1) measures 3 to 4^{mm} in thickness; the edge is beveled and fits neatly in the mouth of the tube. The door measures 25^{mm} across near the hinge; the tube 60^{mm} in length. The walls are badly collapsed, and the lower edge ragged and open. It will be remembered that the spider was found in the earth below the tube when the nest was taken up in November. The first nest which the spider made under my observation was left open at the bottom, and when I attempted to take her out, finding she could not hold down the door, she attempted to bury herself in the soil at the bottom of the tube. The question naturally arises, Is this not left open as a last means of escape from enemies? I am inclined to think it is, in some cases at least with this species, as this is the only resort for safety after the door is open. Further observation is needed on this point.

The trap door of this nest is so hung that it tends to close itself. In Fig. 2, Plate xxiv, at *a* are patches of silk that are drawn on the stretch when the door is open. When all resistance is removed these tend to close the door.

The subject of the food of trap-door spiders is an interesting

¹ Structure and Habits of Spiders, p. 45.

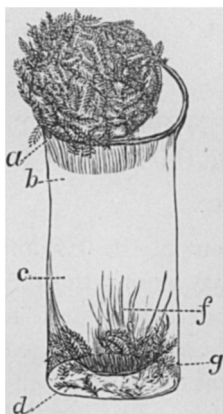
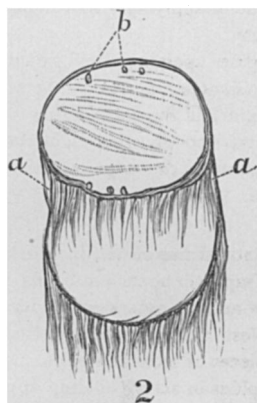
one, and much is yet to be learned of their habits in this respect. While I had the spider out of her tube I offered her several house-flies, holding them by one wing with the forceps near her head. The struggles of the fly attracted her attention. With a quick sweep of the palpi and anterior pair of legs she would clutch the fly and place it between her powerful mandibles, crushing it immediately.

She held some of these about one minute, but I very much doubt her having derived any nourishment from them. One of the smaller species of the flies belonging to the genus *Tabanus* was offered her. It seemed only to frighten her, as she could not be made to touch it even by being angered, but would turn and run away as if in great fear. After returning the spider to her nest, Dec. 8, I placed in the jar two ants and a small carabid beetle. The ants hid themselves in the earth. Dec. 14 the beetle was still unharmed, and I concluded the spider did not come out for food. I then lifted the trap door and placed the beetle inside. Dec. 16 I found the broken hard parts of the beetle strewn about just outside the nest. It had been killed, the soft parts eaten by the spider, and the parts of the skeleton ejected from the nest. Jan. 17, '86, I placed a half dozen large yellow ants in the jar.¹ As they attacked her she would catch and crush them, but I did not see that she ate any of them.

Jan. 2, '86, which was almost like a summer day at Chapel Hill, I went into the woods for the purpose of collecting some moss. While tearing up a large patch of this at the foot of a tree, I discovered a hole which I thought to be the nest of a trap-door spider. I dug down into the tube and found at the bottom a spider belonging to this family. In the afternoon I found several nests and one more female spider. Under some stones I found a male. I placed them in jars of earth containing moss. One of the females escaped, the other built a nest and made a slanting double door which might be compared to an outside cellar door. Each door is made of moss cemented with silk and hung by a semicircular hinge. These the spider will open and shut at pleasure, sometimes fastening them together with a thread of silk. In both of the nests in which I found these spiders there were the remains of ants. I had intended to illustrate and describe farther the nests and habits of these found by myself at

¹The spider was not in her nest.

PLATE XXIV.



G. F. Atkinson - del.

A new Trap-door Spider.

Chapel Hill, as they are lively creatures and seem to offer interesting objects for study as to habit, food and architecture. But as this article is already long, and I wish to make farther collections and study their habits more closely in captivity, I will reserve the subject for a future time.¹

EXPLANATION OF PLATES.

PLATE XXIII.

FIG. 1.—Spider, natural size, dorsal view.

“ 2.— “ “ ventral “

“ 3.— “ “ side “

“ 4.—Spider in the act of unloading a pellet of earth while excavating the tube. *a*, pellet of earth.

“ 5.—Spider applying viscid liquid to the freshly placed pellet of earth. *a*, spinnerets.

“ 6.—Spider applying viscid liquid to the edge of the partially constructed door. *a*, spinnerets; *b*, door; *c*, pieces of moss.

“ 7.—Spider in the act of fitting to edge of the door a pellet of earth, *a*.

“ 8.—Trap door showing eight concentric rings which represent the successive additions to the edge of the door corresponding to the enlargement of the tube. *a*, hinge.

PLATE XXIV.

FIG. 1.—Natural size of nest in which the spider was caught.

“ 2.—Trap door open. *a*, bands of silk which tend to close the open door; *b*, claw and fang marks of spider made while holding down the door.

“ 3.—Nest made in glass test tube. *a*, hinge; *f*, bag of silk; *d*, cork bottom; *g*, pieces of moss and earth.

“ 4.—Spider in act of holding down the door while in the nest. All natural size.

—:O:—

A FEW LEGENDARY FRAGMENTS FROM THE POINT BARROW ESKIMOS.

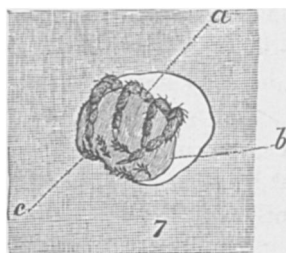
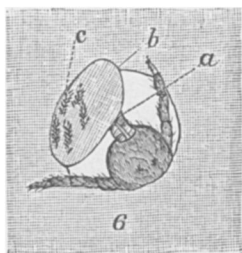
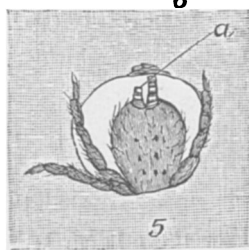
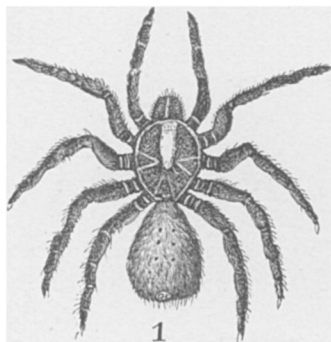
BY JOHN MURDOCH.

DR. Rink, in his “Tales and Traditions of the Eskimo,” has already called attention to the fact that among the rare cases that we have of any Eskimo tradition from the western regions, in what is now the territory of Alaska, there is one legend, that of the sun and the moon, which is identical with a well-known Greenland tradition (p. 237), and from this draws additional evidence of the identity of the Eskimo race over this extensive region.

The following fragments of stories were collected by the writer

¹ A description of these spiders I reserve for a future time when a fuller collection is made and habits more clearly observed.

PLATE XXIII.



G.F. Atkinson del.

A new Trap-door Spider.